Australia’s wheat breeding is geared to tackle long-term agronomic challenges like yield, drought, frost, disease resistance and salinity, and to deliver commercial performing varieties to Australia’s wheat growers.

**WHEAT PRE-BREEDING RESEARCH**

GRDC’s investment in pre-breeding research is about discovering and validating novel genes and traits, and delivering these traits non-exclusively to commercial wheat breeding programs. The focus is on key traits that will make the greatest difference to Australian wheat growers, like improved tolerance to drought, frost and salinity, and disease resistance (for example, rust, crown rot and nematodes).

In 2009-10 GRDC invested $22m of levy money in pre-breeding research in wheat and barley. As a nation the total spend would be in excess of $80m (mostly public sector investment).

GRDC is sponsoring platforms such as the Australian Winter Cereals Pre-Breeders Alliance to ensure closer links between pre-breeding researchers and the commercial wheat breeding companies.

These companies compete for market share and rely on income from End Point Royalties (EPRs) to fund their activities.

**WHEAT BREEDING**

There are now three large, national wheat breeding companies in Australia and one smaller specialist company. All aim to rapidly develop and deliver varieties with improved characteristics to Australian grain growers.

- Australian Grain Technologies Pty Ltd
- InterGrain Pty Ltd
- LongReach Plant Breeders Pty Ltd
- HRZ Wheats Pty Ltd

**NEW VARIETIES**

**WHEAT CLASSIFICATION**

Wheat classification is the categorisation of wheat varieties into grades based on processing and end-product quality.

Wheat Quality Australia Limited:
- determines classes based on market requirements; and
- assesses new wheat varieties into grades.

**NATIONAL VARIETY TRIALS (NVT)**

NVT provide robust, independent results on the performance of recently released crop varieties from trials conducted across Australia. The trial results are publicly available online. www.nvtonline.com.au

GRDC is supporting industry by providing logistical support for the wheat classification process.

GRDC funds the NVT – a national program of comparative crop variety testing. Recommended changes from a review are being implemented.

EPRs are the main income source for commercial plant breeders. Breeders are entitled to receive EPRs for the use of their varieties.

**END POINT ROYALTIES**

**GROWERS**
The business of breeding wheat

There are now three large, national wheat breeding companies in Australia and one smaller specialist company. All aim to rapidly develop and deliver varieties with improved characteristics to Australian growers and draw on the pre-breeding program co-funded by GRDC.

Wheat breeding trial sites across Australia

- Australian Grain Technologies sites
- LongReach Plant Breeders sites
- InterGrain sites
- HRZ Wheats sites
- Capital cities

AUSTRALIAN GRAIN TECHNOLOGIES PTY LTD

Contact: Dr Steve Jefferies, www.ausgraintech.com, 08 8303 6862
Shareholders/owners: Vilmorin & Cie (Limagrain), SARDI, University of Adelaide, GRDC.
Breeding program: Five wheat breeding programs for varieties adapted to different agronomy/growing conditions and soils including daylight length, temperature, soil type, diseases and specific regional quality needs.

- Region BReeder PRIoRiTiES INCLUDE QUALITY KEY VARIETIES
  - QLD and northern NSW Dr Mei Qiong Lu Ruts, crown rot and root lesion nematode High protein, Prime Hard for export Ventura®, Livingston®, Ellison®, Sunzel®, Marombe®, Carinya®
  - Southern NSW and Vic high-rainfall zone Dr Russell Eastwood Ruts, Septoria, cereal cyst nematode (CCN), acid tolerance Domestic and export focus, hard grained for bread, soft grained for biscuits and noodles Bolac®, Yenda®, Young®
  - SA, Vic Mallee and WA Mallee Dr Haydn Kuchel and James Edwards Ruts, CCN, yellow leaf spot, drought tolerance, Clearfield Export focus, hard grained for bread and noodles Gladius®, Cornell®, Espada®, Axe®, Mace®, AGT Katana®
  - WA Dr Jason Reinheimer and Kevin Young Yellow leaf spot, rusts, acid tolerance, sprouting tolerance Export focus, hard grained for bread and noodles H45®, Hybrid Mercury
  - All regions: national hybrid wheat breeding program Michael Quinn Rust, vigour, yellow leaf spot Export focus, hard grained for bread and noodles
### Longreach Plant Breeders Pty Ltd
**Location and Staff:** Narrabri, Clare, Melbourne, York, Adelaide: 10 staff.
**Contact:** Dr Bertus Jacobs, www.longreachpb.com.au, 08 8382 4166
**Shareholders/Owners:** Pacific Seeds Pty Ltd, Syngenta.
**Breeding Program:** Breeding for four distinct regions, plus breeding alliance for soft wheats.

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<th>REGION</th>
<th>BREEDER</th>
<th>PRIORITIES INCLUDE</th>
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<td>Northern Alkaline – northern NSW and QLD</td>
<td>Dr Bertus Jacobs</td>
<td>Yield, resistance to crown rot, leaf stem and stripe rust and pre-harvest spraying</td>
<td>Australian Prime Hard (APH)</td>
<td>Crusader&lt;sup&gt;1&lt;/sup&gt;, Spitfire&lt;sup&gt;1&lt;/sup&gt;</td>
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<tr>
<td>Southern Alkaline – SA and Vic Mallee</td>
<td>Dr Bertus Jacobs</td>
<td>Yield, high test and grain weights; resistance to CCN, stem, leaf and stripe rust</td>
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<tr>
<td>Southern Acid – southern NSW and Vic</td>
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<tr>
<td>WA</td>
<td>Dr Bertus Jacobs</td>
<td>Yield, yellow leaf spot, stripe rust</td>
<td>APW, AH</td>
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<td>NSW, SA and WA</td>
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<td>Soft biscuit wheats</td>
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FREQUENTLY ASKED QUESTIONS

PRE-BREEDING

What is GRDC’s level of investment in pre-breeding?
In 2009-10 GRDC directed more than $22m of levy funds into wheat and barley pre-breeding. Without this significant effort in pre-breeding, commercial varietal breeding programs cannot be successful. Pre-breeding investment reflects grower priorities including yield, drought, frost, disease resistance (for example rust and crown rot) and salinity.

Who does GRDC collaborate with?
GRDC partners with public and private organisations, including the various state government departments of agriculture, the CSIRO, a great number of universities and the Australian Centre for Plant Functional Genomics. International partnerships are with the International Center for Agricultural Research in the Dry Areas (ICARDA) in Syria and the International Maize and Wheat Improvement Center (CIMMYT) in Mexico.

BREEDING

How has GRDC’s investment in wheat breeding changed?
Today’s wheat breeding is a commercial business. Except for areas of market failure such as durum and dual purpose wheat, GRDC no longer invests grower levies directly in wheat breeding projects and therefore has no ownership in new variety releases. However, GRDC has equity investments in some commercial wheat breeding companies based on its historical funding of these programs. Operational funding for these companies comes from End Point Royalties (EPRs).

Why did this change occur?
GRDC’s investment strategy for wheat breeding has changed in response to a changed environment for wheat breeding. GRDC was only ever a minority funder of wheat breeding in Australia. From the late 1990s, public investment in breeding declined. However, the 1994 Plant Breeder’s Rights legislation created opportunities to capture value for breeding programs in the form of seed and End Point Royalties. This provided an incentive for private investment in breeding. GRDC has been re-directing levy money into pre-competitive, strategic pre-breeding research and other important parts of the GRDC portfolio.

What are the benefits from this change?
The current commercial structure provides the basis for sustainable wheat private investment in Australia. It also attracts private investment which in turn provides access to technologies and resources not currently available to Australian breeders.

END POINT ROYALTIES

Why do growers have to pay EPRs?
The Plant Breeder’s Rights Act (1994) grants breeders’ ownership of their varieties and enables them to set conditions on their use by others including for commercial purposes. By means of a PBR License Agreement breeders will grant growers non-exclusive rights to produce and sell grain subject to agreed terms and conditions, which may include the payment of EPRs. In Australia EPRs are now the main income source for commercial breeding companies. Through EPRs breeders and growers share the risks of grain production as breeders’ income is directly linked to seasonal conditions and to the level of variety performance and grower satisfaction. Hence EPRs are a commercial incentive to breed better adapted and better yielding varieties.

NATIONAL VARIETY TRIALS

What are the changes planned for NVT in 2017?
Growers will have increased involvement in setting trial management processes for NVT.

Can growers access information from NVT about a variety’s performance before the variety is commercialised?
Currently, NVT performance data is only released when a variety is commercialised. Changes are being negotiated with breeding companies with a view to release data one year before a variety is commercialised.

Can NVT results be relied on?
Trials conducted by NVT are robust and independent. Only trial results that meet NVT data quality requirements will be published.

Useful resources:

- **GRDC Wheat Breeding Supplement**
  Copies available from Ground Cover Direct, 1800 11 00 44 or www.grdc.com.au/wheatbreeding

- **PBR Agreement Fact Sheet**
  Copies available from Ground Cover Direct, 1800 11 00 44 or www.grdc.com.au/GRDC-FS-PBR-Agreement

- **EPRs on varieties**

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